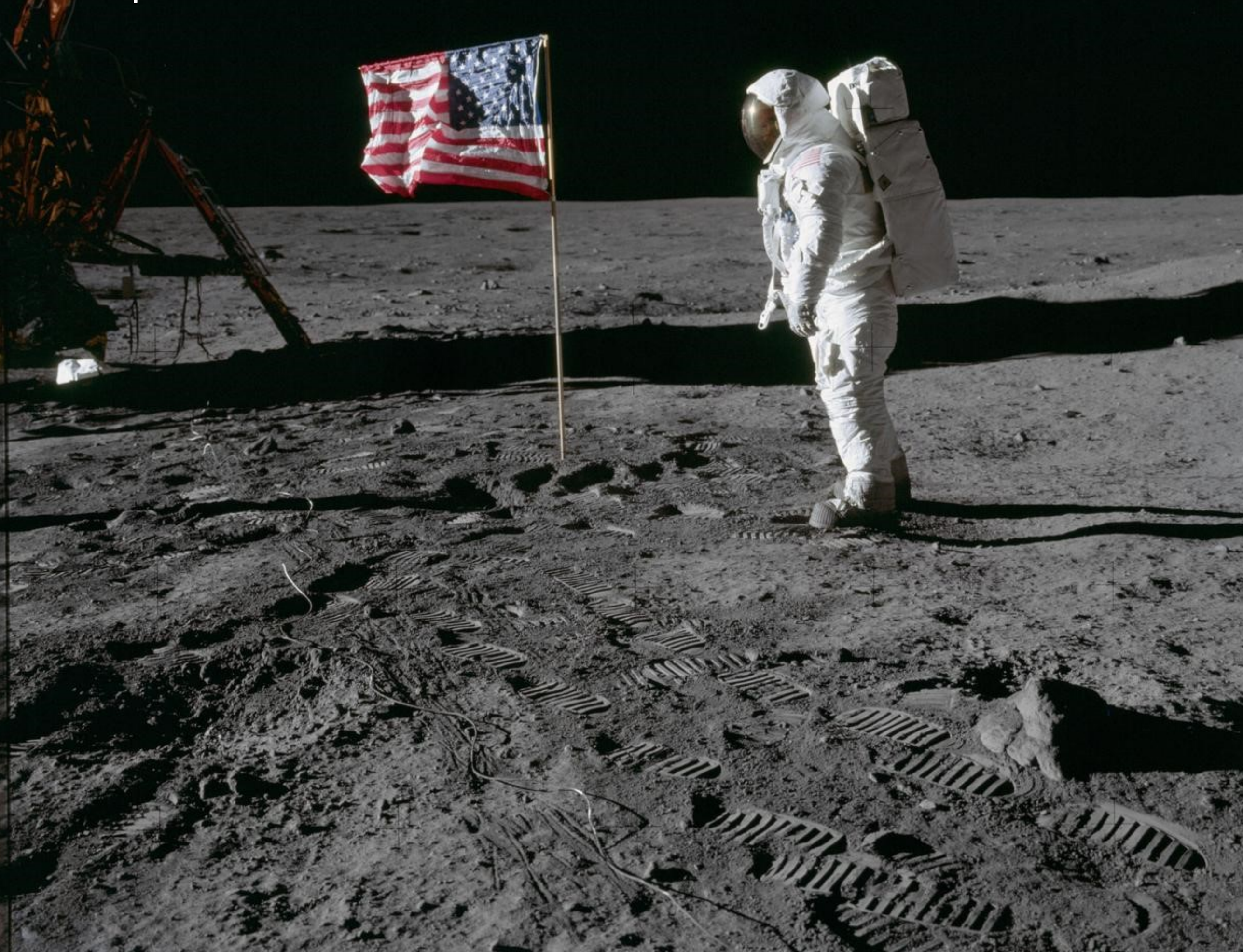
Garland In Space

50 years ago this July, the ears and eyes of Americans and citizens throughout the world were finely tuned to their radio and television sets as they occupied ringside seats in one of man's greatest adventures: the Apollo 11 moon landing. As the three-man crew of American Astronauts approached the moon and prepared for the first lunar walk by Neil Armstrong and Buzz Aldrin, thousands of people in the Garland area had a particularly keen interest in the spectacle. They were the scientists, engineers, production workers and other employees of the large numbers of Garland-area industries who contributed to the historic Apollo 11 mission.



Garland Assists With Moonwalk

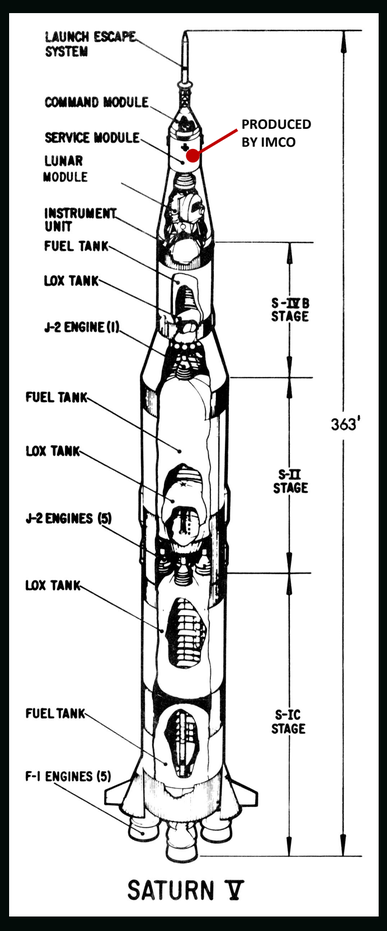
VARO, Inc.

- The Semiconductor Division in Garland furnished bridge rectifiers (an electrical device which converts an alternating current into a direct one by allowing the current to flow through it in one direction only) that were used in the ground support equipment to check out the Apollo 11 flying hardware prior to launching the moon mission.
- Developed an alternator for the Lunar Excursion Module (LEM). The alternator is used during the flight of the LEM from the Apollo spacecraft to the surface of the moon. The alternator provides up to 3,000 watts of power.

VARO Semiconductor VE08 Bridge Rectifier

INTERCONTINENTAL Manufacturing Co. (IMCO)

- Produced 11 items that were part of the Apollo-Saturn V system.
- 8 Saturn motor cases and closures, part of the Launch Escape System, jettison the escape tower 3 minutes and 8 seconds after take-off.
- Two interstage assemblies built by IMCO keep the motor case in position during the strenuous take-off.
- In case of an abort at take-off or within a limited time after that, the 33,000 pound thrust provided by the IMCO case and closure would guide the command module toward the ocean for safe landing.




Hold-down arm ready for installation, November 1964. 16 were produced for the mobile launchers.

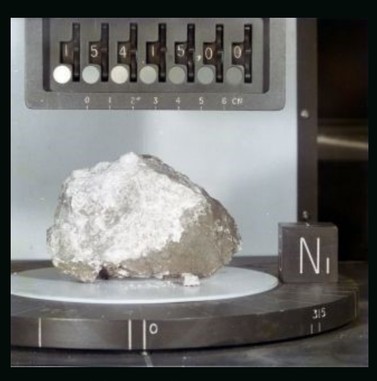
SPACE Corp.

- Primary supplier for a number of basic launch support products used in the test before the space vehicle was launched.
- Supplied engine support equipment and camera equipment used to monitor operations in the spacecraft.
- Provided launch equipment including the hold-down arms which restrain the motion of the Saturn vehicle until sufficient thrust is attained to allow liftoff. The arms include release mechanisms which are actuated upon command and retract within a fraction of a second to set the vehicle free for flight.

LTV ELECTROSYSTEMS, Inc.

- Designed, fabricated and installed the massive automated display board at NASA's Manned Spacecraft Center in Houston. The big board which displays the exact position of an orbiting space vehicle on a large map of the earth, also displays in real time the amount of time elapsed since the rocket lifted off from the pad. Such factors as the time remaining until return to earth or displaying change in flight plan information can also be displayed.


Apollo Mission Control Center in Houston, Texas. LTV's Garland Division designed, fabricated and installed the massive display board which is the focus of the Mission Control Center.


Moon Rock from Apollo 15 mission in l1971.

CONTROL & COMPUTING DEVICE Co.

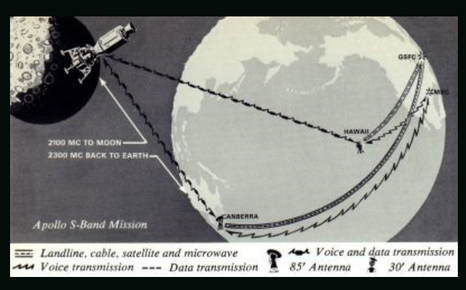
- Built a console with tests and calibrates the instruments used in evaluating the rock samples with Apollo astronauts brought back with them.
- The instruments utilize the infrared technique to see what the naked eye can't see—radiation wavelengths.

Garland Neighbors:

VARO, Inc., Plano Division

- The Static Power Division in Plano manufactured transformers that helped keep Apollo 11 on its pre-determined course as a part of the command ship's computer regulated guidance and control system.


Faula Dillard, assembler at Varo's Static Power Division in Plano, holds a transformer like those in Apollo 10 and 11.




One-third scale mock-up of Apollo spacecraft mounted on a range rotator at the Collins Antenna Division in Richardson


An 85-foot-diameter antenna produced by Collins Radio Co.

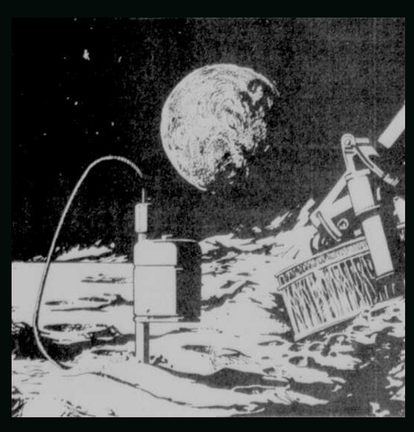
COLLINS RADIO Co., Richardson Division

- Manufactured part of the 10 equipment units in the Command Module communication and data system. The Command Module communication system handles two way voice conversations of astronauts with ground controllers; sends and receives data between earth and spacecraft; transmits color television to earth; received and transmits signals for tracking the spacecraft ; provides voice and data communication between the Command Module and Lunar Module astronauts; and furnishes communication for recovering the Command Module when it returns to earth.
- Designed and equipped 14 ground stations around the earth with tracked and communicated with both the Command Module and the Lunar Module. Three of the stations, located in Australia, California and Spain, had 83-foot diameter antennas and handled all communication and tracking of the spacecraft during deep space phases of the mission between earth and moon.

Garland In Space Since Apollo 11

GEOTECH

- Designed and built an active phase lunar seismometer system that studies the moon mantel by sound wave probes.
- System was to go up on Apollo 12, 13 and 14.
- The small Active Detonation System (ASDS) is a subsystem of the Active Seismic Experiment (ASE) of the Apollo Lunar Surface Experiments Package (ALSEP). Spacemen detonated explosive charges on the mon so sensitive earphones could pick up, amplify and direct the echo back to earth through the central communication system.
- After the astronaut leaves the moon, rocket grenade are actuated by remote control to induce another artificial seismic signal for a larger scale calibration and reference. The ASDS then functioned automatically for one year, radioing signals back to earth.

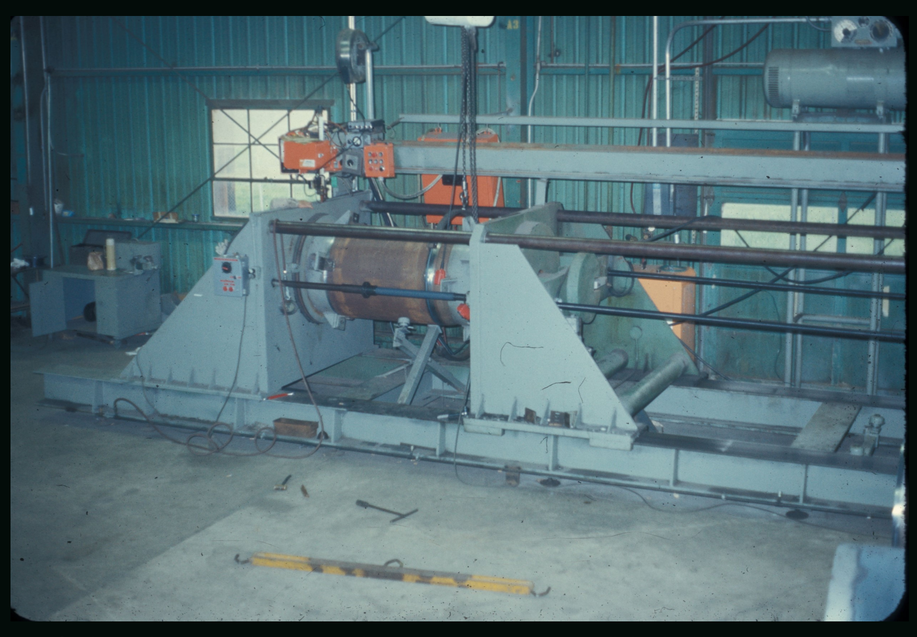


Geotech's Seismometer, such as the one shown in this drawing, will record seismic phenomenon on the moon.

A Delta II rocket launches from Cape Canaveral.

INTERCONTINENTAL Manufacturing Co. (IMCO)

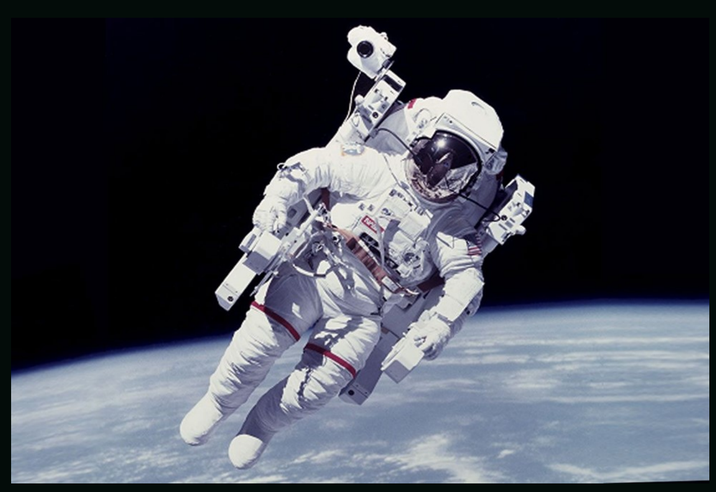
- Manufactured Castor 4 solid-fuel rocket stages and boosters for some Delta, Delta II, Atlas IIAS and Athena launch vehicles.
- Designed and manufactured yolk to balance rockets, such as Delta II, when raised from horizontal to vertical for take off.

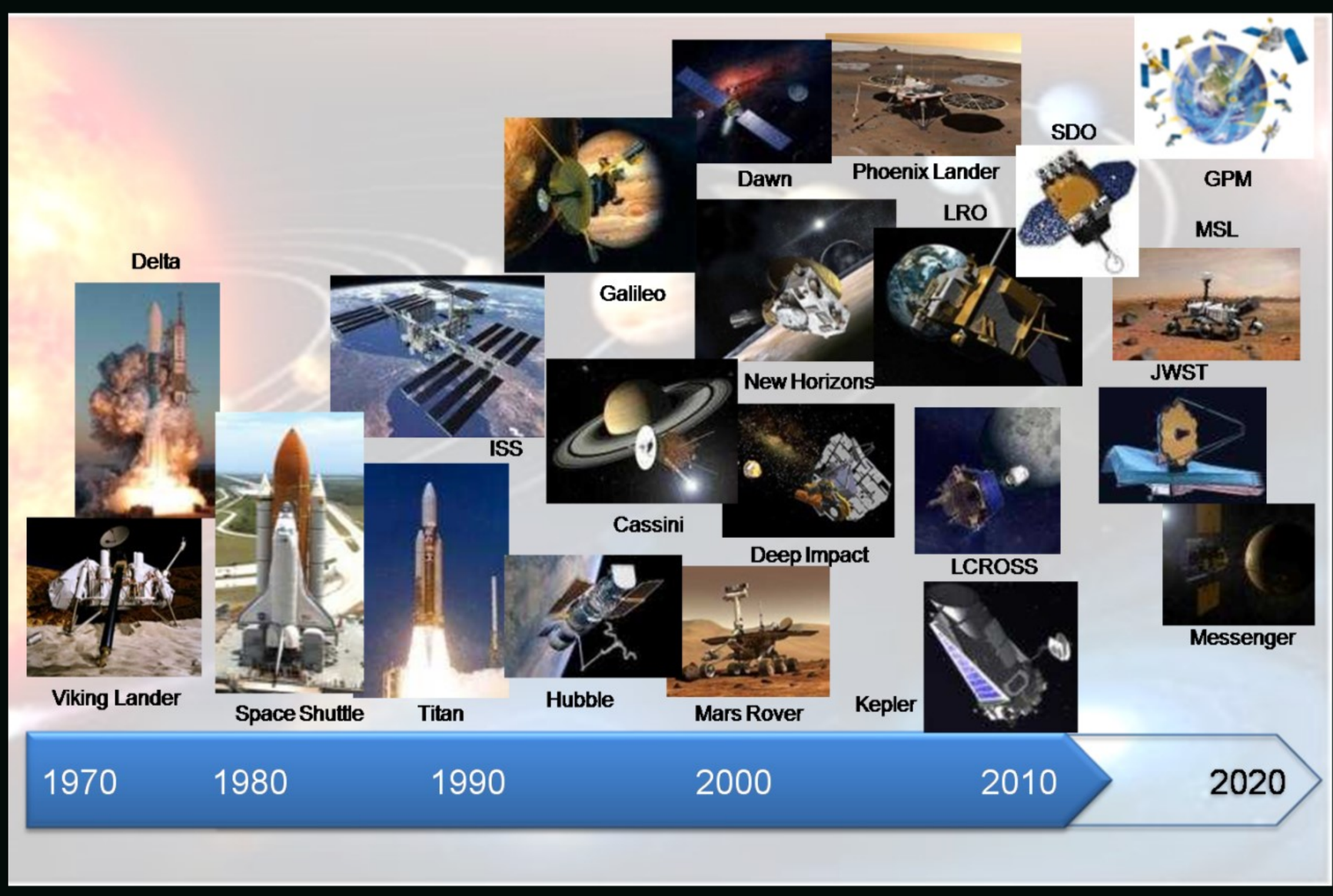


At 38 feet long and approximately 48 inches in diameter, the motor cases were rolled and welded in sections by the weld fixture pictured here.

MICROPAC Industries, Inc.

- Micropac has supplied space level microcircuit modules and components since the mid 1970's. Products have been used in "mission critical" applications on launch vehicles, spacecraft, Mars Rovers, the International Space Station, spacesuits, and space telescopes.
- One of the earliest programs was the Viking Lander, which used a custom power hybrid from Micropac.
- Satellite programs include classified programs, NASA, military and commercial satellites. Many different scientific instruments on spacecraft have used Micropac designs.
- Other applications include star trackers, retro rocket firing mechanisms, camera systems, power distribution systems, motor controllers and thermostats.
- Products supplied for space include custom Multi-Chip Modules, Solid State Relays, Solid State Power Controllers, Optocouplers, and Hall Effect Devices.





MICROPAC Supports the Astronauts

Micropac Supports the Astronauts Extravehicular Mobility Unit by supplying components for various functions including:

- Current Limit Circuit- Limits current to the communication system.
- Current Limit Circuit- Limits current to the Astronaut's EKG probes.
- System Status LED Indicator- On the suit control status panel, Micropac supplies the LED indicator that indicates power status on the Astronaut's Chest Mounted Instrument Display
- Electrical System Coupling- Micropac provides Optocouplers for circuit coupling within the System control electronics.